

CHAPTER 1. MAINTENANCE INSPECTION NOTES

1. INTRODUCTION. This advisory circular provides maintenance information which can be used by mechanics, repair agencies, owners, and operators in developing maintenance programs, making improvements in existing programs, and conducting inspections and repairs on certain structural parts of the McDonnell Douglas DC-8 series of airplanes. The material is based, in part, upon information made available through discussions with personnel who have maintained these types of airplanes for thousands of hours of time in service. The intent of the circular is to impart some of this knowledge to other interested persons so that it is not lost.
2. DESCRIPTION. This circular contains guidance material for performing inspection and maintenance on wings, fuselage, empennage, flight controls, pylons/nacelles, and landing gear structures. The information has been derived from service experience. It does not comprise a full and complete maintenance program for the subject aircraft but should be considered as supplemental maintenance data. Included in the circular are diagrammatic sketches and station identifications of the wing, fuselage, and flight controls.

In addition, there is a listing of selected maintenance difficulties which were reported during 1970 and 1971. Appendix 3 contains special structural items which are recommended for rework and/or periodic inspection to assure continued structural integrity of high time DC-8 aircraft.

3. BACKGROUND.
 - a. Aircraft Use. The Administrator has realized that several different types of transport aircraft are being phased out of service by some airlines because of the availability of newer equipment. Such older aircraft are being purchased by other operators who may not be familiar with the scope of required maintenance and the means which have been used to keep the aircraft in a safe and airworthy condition.
 - b. Maintenance "Know How." Since maintenance "know how" is not transferred with the aircraft, the new operator generally goes through a learning cycle before he is able to rapidly pinpoint the critical problem areas of the aircraft. In this respect, identification of known areas where structural problems have been experienced will help in the preparation of an initial maintenance program by a new operator. It can also serve as a guide to other operators who have not accumulated sufficient experience to have knowledge of all the problem areas of the aircraft.

4. GENERAL INFORMATION.

- a. Manufacturer's Bulletins. It must be emphasized that the manufacturer has published several service bulletins concerning the inspection, repair, and modification of McDonnell Douglas DC-8 series aircraft. Service bulletins highlight the importance of maintaining structural integrity on aircraft with particular reference to areas known to have experienced crack and corrosion damage. Operators are urged to become conversant with the manufacturer's recommendations and make certain that responsible maintenance personnel are knowledgeable on this subject.
- b. Airworthiness Directives. It is emphasized that the material in this circular does not supersede any of the requirements of airworthiness directives issued under Part 39 of the Federal Aviation Regulations.
- c. Certification Basis. The United States type certificate holder is McDonnell Douglas Corporation, Long Beach, California. The basic design and first production airplane was the DC-8-11 Model approved for transport category by the FAA on August 8, 1959. The Type Certificate Data Sheet No. 4A25 prescribes conditions and limitations for which the type certificate was issued. However, the data sheet may be revised from time to time as conditions and limitations change. Thus, it is important that the latest data sheet revision be available whenever a problem arises that may be covered in the data sheet. Twenty-one models of the DC-8 have been manufactured, the basic being the DC-8-11 and the latest being the DC-8-63F.

5. TYPE OF CONSTRUCTION. The major structural components of the aircraft are the wing group, the fuselage group, and the tail group. The primary structure, consists of the fuselage, pylons, wing, and the vertical and horizontal stabilizers. These components have been designed in accordance with the "fail safe" policy. This policy provides multiple load paths and reduced stress levels, such that a single failure of any structural element will not result in the loss of the complete structural component. Several flap system components meet the "safe life" requirements and the life limits for these parts are listed in Note 3 of Type Certificate Data Sheet No. 4A25.

- a. The wing is an all-metal, full cantilever-type structure and consists of a center section which extends from the airplane centerline to the dihedral and sweepback at station $X_{cw}69.5$, the inboard section extending from the sweepback to station X_w408 , and the outboard section from station X_w408 to the wing tip. The primary structure consists of three spars, ribs, bulkheads, and paneling of multiple stringers and stressed plating. The areas between the front and rear spars are used as integral fuel tanks. The wing has four high lift leading edge slots and provisions are

incorporated in the structure for attachment of flaps, spoilers, and ailerons. The leading edge and tips are the only portions not permanently joined to the wing structure; all other portions are not disassembled except for major repair of primary structure.

- b. The fuselage is an all metal structure composed of stressed aluminum alloy skin attached to transverse frames and longitudinal stiffeners. It is divided into three main sections:
 - (1) The nose section (station 40 to 310), the center section (station 310 to 1490), and the tail section (station 1490 to 1795).
 - (2) Where plating of .071 inch thickness or less is attached to the frame, titanium rip stoppers are used for reinforcement and beaded doublers are used in the window belt area forward of the front spar. The frames are generally located at 20-inch intervals throughout and longitudinal fuselage splices are reinforced with beaded inner doublers and pi-section longerons.
 - (3) A keel is used to carry structural loads in the main gear wheel-well area and extends from station 680 to 1090 with a splice at station 920. The fuselage is fully pressurized above the floor from station 109 to the aft pressure bulkhead at station 1490, and below the floor in the cargo and accessories compartments.
 - (4) The cargo compartments are Class D compartments, and by design, will not support combustion which eliminates the need of having fire extinguishing equipment in the cargo compartments; they are also heated to prevent freezing.
- c. The pylons are multiple spar and bulkhead structures of high strength aluminum alloy, steel, and titanium. The engine mounts are connected to the pylon bulkheads and loads are transferred to the wing through fittings, angles, and clips.
- d. The stabilizers, vertical and horizontal, are full cantilever portions of the empennage section. The vertical stabilizer is a fixed portion of the fuselage with a removable leading edge and tip. The horizontal stabilizer is a removable three-section unit consisting of a center section and two outboard sections with operating bulkheads between the center and outboard sections. The leading edge and tips of the outboard sections are removable. The vertical and horizontal stabilizers contain fittings for rudder and elevator attachment.

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6. GENERAL VISUAL INSPECTION TIPS. The primary structure of the aircraft is designed to provide resistance to variable forces imposed while in operation by dispensing the forces through a structural pattern of "force flow" to the primary structural members of the wing and fuselage. External indications of failure, such as distorted skin, tilted or sheared rivets, and torn, dented, cracked, or corroded skin are usually obvious. Wrinkled skin, "oil cans," and tilted rivets, adjacent to the obviously failed area often indicate secondary damage caused by transmission of stress from the failed area. Misalignment of doors and panels may indicate distortion of internal structure. Internal structural damage, although not always apparent, may be found by closely examining the exterior surface. For example:
- a. Buckled skin between rivets at the end of a stiffener or stringer could mean that the last attaching rivet has failed, or that the stiffener or stringer is buckled in the area of the skin buckle. When a detailed inspection of the failed area is to be performed, functional parts should be actuated to determine if the failure has caused binding.
 - b. Deep diagonal skin buckles, located over a frame, former, or rib, could mean the member is distorted. When doubt exists concerning internal condition, the area in question should be opened and carefully inspected.
7. NONDESTRUCTIVE TESTING (NDT). Nondestructive testing is a maintenance inspection procedure which includes utilization of such maintenance tools as X-ray, ultrasonic, magnetic particles, eddy current, dye penetrant, and others.
- a. Maintenance Inspection. NDT permits maintenance inspections without removing components from aircraft or tearing down complex assemblies. Defects in various aircraft systems which would escape detection through normal visual inspection can be identified by NDT.
 - b. Training Required. Special NDT training is desirable to make sure that the operator is capable of operating the equipment and interpreting the results. Also, many states require that an X-ray operator have an approved certificate for use of X-ray in industrial applications. This is to minimize improper use with attendant health hazard of X-ray equipment.
8. AIRCRAFT STATION DIAGRAMS. The wing, fuselage, and empennage station diagrams included in this document were developed for the DC-8 aircraft and are used as a general reference only. Several models of these aircraft were manufactured and have different station locator numbers based on the particular configuration. Since the defective areas generally apply to all models of aircraft, the referenced area can be compared with a similar area and locator on the appropriate station diagram for the particular model of aircraft.

9. DEFINITIONS.

- a. Fatigue. The progressive fracture of a metal by means of a fault which develops and spreads under repeated cycles of stress.
- b. Stress. The force per unit area of a body that tends to produce a deformation.
- c. Stress raiser. A scratch, groove, rivet hole, forging defect, or other structural discontinuity giving rise to a focal point for a local concentration of stress.
- d. Corrosion. Gradual destruction of a material by chemical action. Often evidenced by oxide buildup on the surface. (See Chapter 9)

10. ABBREVIATIONS USED IN THIS DOCUMENT.

AOL	All operators letter
AD	Airworthiness Directive
F/S	Fuselage station
MLG	Main landing gear
NLG	Nose landing gear
P/N	Part Number
SB	Service Bulletin
W/S	Wing station
I/B	Inboard
O/B	Outboard
R/W	Right Wing
L/W	Left Wing

CHAPTER 2. WING

11. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of significant maintenance difficulties that have been reported by air carriers. This information may be useful in identifying structural inspection areas. Except where noted, wing structural references apply to both left and right wings.

a.

Center Wing SectionMcDonnell Douglas
Reference For Details

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| (1) <u>The vertical flange</u> of the inner wing bulkhead lower chord member at station X_{rs} 22.750 has been found cracked. Inspection should also include upper chord member. | SB 57-9
6/28/60 |
| (2) <u>The forward tang</u> of the lower front spar cap has been found cracked at W/S X_{cw} 46.000. | SB 57-37
1/29/65 |
| (3) <u>Cracks have been found</u> in the web of the wing trailing edge panel between stations X_w 5.812 and X_{wf} 60.000. | SB 57-58
1/19/68 |
| (4) <u>Corrosion has been found</u> on the inner surface of integral fuel tank access doors and doubler lands on aircraft with approximately 9000 hours flying time. The corrosion was found on the topside doors and lands. | SB 57-31
8/23/63
Reissued
11/1/64 |

b. Inboard Wing Section.

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| (1) <u>Leading edge formers</u> have been found cracked at the upper and lower segments of the aft end. The cracks were between 1/4" to 2 3/4" in length. Inspection of these formers should be from station X_{fs} 138.750 through X_{fs} 245.000. | SB 57-11
5/19/60 |
| (2) <u>Cracks have been found</u> in the bulkhead upper and lower caps at station X_{rs} 139.000 just forward of the rear spar. | SB A57-7
Reissued
9/24/64
SB 57-7
Rev 1
7/25/60 and
AD 60-8-3 |

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- (3) An alert bulletin was issued due to cracks being found in the lower wing flap support fitting chord member in the bulkhead at station X_{rs} 358.000. The cracks occurred in the bulkhead chord member between the barrel nut retainer hole and the end of the part. SB A57-17
Reissue No. 2
3/20/61
- (4) Cracks have been found in the lower leading edge skin of the pylon stub wing adjacent to the I/B side of each I/B pylon. The cracks emanate from the inside radius of the skin cutout at the intersection of the edge of the skin and the pylon. This also applies to the outboard wing section leading edge skin inboard of the O/B pylons. SB 57-19
Revision No. 2
1/26/67
- (5) Several operators have found cracks in the lower front spar cap tang at W/S X_{fs} 67.531. The cracks occurred on the forward tang of the spar cap at the splice. Cracks have also been found in the upper front spar cap tang at the splice at W/S X_{fs} 67.531. SB 57-30
Rev 2
10/31/67 and
SB 57-34
Rev 2
10/27/67
- (6) Loose attachments in the top trailing edge skin have been reported by operators on aircraft with more than 10,000 flight hours. The manufacturer modified all applicable models prior to delivery of fuselage #285 and subsequent. The modification installs a doubler from W/S X_w 70.000 to X_w 113.000. SB 57-41
9/7/66
- (7) A service bulletin was issued to inspect for cracks in the I/B aft corner of the leading edge upper slot door assemblies. This bulletin applies to aircraft prior to fuselage #315. SB 57-46
3/6/67

c. Outboard Wing Section.

- (1) An inspection and rework bulletin was issued as a result of a report of an aileron hinge fitting lug breaking off at station X_a 448. SB A57-15
Reissue #1
8/8/60
- (2) Electrical junction box support clips on the rear spar have been found cracked between station X_{rs} 470 and X_{rs} 479. The cracks occurred in the clip lobes at the rear spar attach point. SB 57-16
11/29/60

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- (3) Operators have reported cracks in the stub wing leading edge of the O/B pylons in the area of the pneumatic duct cutout.
- (4) Cracks have been found in the wing leading edge lower structure between the opening for access door 520J and W/S X_{FS} 526.760 on aircraft with four percent wing leading edge.
- (5) Cracks have been found in the wing leading edge lower surface skin on aircraft with 15,000 to 20,000 flight hours. The cracks developed between access door 520J and W/S X_w 454.000 on aircraft with standard wing leading edges.

SB 57-25
Rev 2
8/27/62

SB 57-48
3/3/67

SB 57-59
4/11/68

CHAPTER 3. FUSELAGE

12. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of significant maintenance difficulties that have been reported by air carriers. This information may be useful in identifying structural inspection areas. Except where noted, fuselage structural references apply to left and right sides of the fuselage.
- a. Tail cone structure has been found cracked. The cracks are a result of sonic vibration which is prevalent in the tail cone area during operation of the aircraft.
 - SB 53-17
 - 10/5/60
 - SB 53-11
 - Rev 2 5/1/61
 - SB 53-13
 - Rev 2 3/24/61
 - SB 53-19
 - 11/1/60
 - SB 53-25
 - Rev 1 2/27/62
 - b. Cracks have been reported in the aft vertical stiffeners of the O/B MLG wheel well webs.
 - SB 53-21
 - 3/24/61
 - c. Cracked fuselage to skin shear clips have been found cracked on aircraft with 5,000 hours flight time. The affected areas are at F/S Y 640.000 between longerons 22 and 23 and F/S Y 660.000 between the cusp line and longeron 23.
 - SB 53-28
 - Rev 2
 - 6/26/63
 - d. Cracks have been found in longeron 24 at F/S 980.000 on aircraft with 10,000 or more flight hours.
 - SB 53-32
 - Rev 1
 - 9/17/65
 - e. Cracks in the MLG I/B door actuating cylinder support fittings have been reported. The fittings are located on the left and right sides of the keel beam at F/S 920.000.
 - SB 53-33
 - 1/21/66
 - f. Cracks in the domed aft pressure bulkhead have been reported. Cracks were a result of fatigue and occurred at approximately 15,000 flight hours.
 - SB 53-41
 - 10/17/67
 - g. Cracked vertical angles located at the upper portion of the aft flat pressure bulkhead have been reported by one operator on an aircraft with 14,000 flight hours.
 - SB 53-46
 - 3/28/68

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- h. Fuselage skin corrosion has been found on an aircraft with approximately 25,000 flight hours. The corrosion was in the scuff plate area of passenger, service, and cargo doors.
- i. Fuselage frame fittings have been found corroded on aircraft with between 21,000 and 30,000 flight hours. The corroded fittings were located at F/S 920 and 960.

SB 53-53
12/20/68AOL 8-169A
8/30/68

CHAPTER 4. FLIGHT CONTROLS

13. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of significant maintenance difficulties that have been reported by air carriers. This information may be useful in identifying structural inspection areas. Except where noted, flight control structural references apply to left and right sides.

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| a. <u>Flap support fittings on the aft side of the rear spar have been found cracked.</u> Examination indicated stress corrosion developed and cracks propagated from the corroded area. | SB A27-5
Reissue #2
3/1/61 |
| b. <u>Operators have experienced cracking of the rudder nose rib webs at the three hinge point locations and in the rib to spar attach angles, (Stations Z_r 105.000, Z_r 162.906, and Z_r 220.813).</u> | SB 27-48 |
| c. <u>An alert bulletin was issued by the manufacturer due to a report of a left O/B elevator geared tab push rod being broken at the aft rod end fitting, rod P/N 4702890.</u> | SB A27-66
6/20/60 |
| d. <u>The aileron reversion mechanism forward gripper has been found cracked at the lower clevis ends which attach to the end of the aileron tab lockout cylinder piston end fitting.</u> | SB 27-95
Reissue #1
5/18/62 |
| e. <u>Clevis P/N 2619862 on the rudder lockout cylinder was found broken. This allowed the rudder to revert to manual with hydraulic power still on causing the rudder to lock in its last position.</u> | SB A27-100
Reissue #2
9/24/64 and
AD 61-6-4 |
| f. <u>Cracks have been found in the aileron tab lockout mechanism support brackets P/N 4643350.</u> | SB 27-115
Rev #1 10/25/61
and AD 62-2-4 |
| g. <u>Wing flap actuating cylinder barrels have been found cracked. Examination of failed cylinders disclosed corrosion in the internal portion of the barrel.</u> | SB 27-118
Reissue #2
12/4/61 |
| h. <u>Wing flap support track assemblies have been found cracked at W/S X_f 219.498. Analysis indicated the cracks could have been caused by stress corrosion.</u> | SB 27-123
12/27/61 |

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| i. <u>Wing flap rod end bearings</u> have been found cracked with more than 5000 hours. The cracked bearings were located at W/S 98 and 219 in the area of the bearing case adjacent to the bearing dust shield. | SB 27-127
Rev. #2
1/28/64 and
AD 62-12-4 |
| j. <u>Wing flap actuating cylinder barrels</u> have failed. Both mid-wing and O/B actuating cylinders have been found cracked. | SB 27-134
Reissue #1
10/19/62
SB A27-134
Reissue #2
10/13/64 and
ADs 62-16-2
and 62-24-4 |
| k. <u>Wing flap link assemblies</u> P/N 5644642-501 at W/S X _w 97.906 and P/N 5644644-501 at W/S X _f 219.498 have been found broken on several occasions. | SB 27-137
Rev. #1
1/8/64 |
| l. <u>Cracks have been found along the horizontal centerline of the forward attach lugs of the flap link support assemblies on aircraft with more than 8000 hours.</u> | SB 27-142
Reissue #1
5/15/63 |
| m. <u>Operators have experienced failure of the O/B wing slot assembly, P/N 3770143-1, on aircraft with four percent extended wing leading edge.</u> | SB 27-159
Reissue #1
2/23/65 |
| n. <u>Cracked flap hinge support fittings have been found in the O/B flap center hinge base assembly on aircraft with between 8000 and 11,000 hours..</u> | SB 27-217
Rev. #1
10/9/68 |
| o. <u>Rudder link, P/N 2619201, failures have occurred on aircraft with 23,000 to 26,000 hours.</u> | SB 27-218
Rev. #1
10/18/68 |
| p. <u>Cracked aileron tab rod and assemblies have been found on aircraft with 3,000 to 29,000 hours.</u> | SB 27-223
12/6/68 |

CHAPTER 5. LANDING GEAR

14. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of significant maintenance difficulties that have been reported by air carriers. This information may be useful in identifying structural inspection areas. Except where noted, landing gear structural references apply to left and right landing gear.
- a. Intergranular corrosion and cracking have been reported on main and nose gear aluminum "B" nuts on landing gear pipe assemblies. SB 32-28
Rev. #1
11/13/61
 - b. Cracks have been found in the MLG retract strut barrels. The cracks occurred in a flash weld area of the barrel. SB 32-51
Reissue #1
Rev. #1
6/28/61
 - c. Operators have reported failure of the bolt assembly attaching the aft brake compensating links to the MLG piston. SB 32-53
Reissue #1
5/4/61
 - d. Cracked and broken MLG bogie beam pivot bolts have been found which appeared to be caused by lack of lubrication. SB 32-60
Reissue #1
8/3/61
Rev. #1
2/27/62
 - e. MLG bogie beam trim cylinder forward attach bolts have failed allowing the bogie beam to rock freely without snubbing. SB 32-61
Reissue #1
2/2/62
 - f. MLG actuating cylinder upper attach brackets P/N 5641950-1, -2, -501, or -502 have been found broken. SB A32-76
Reissue #1
Rev. #1
4/5/62 and
AD 62-23-3
 - g. MLG bungee cylinder rod-end eyebolts have been found cracked in the threaded area. Eyebolt P/N 4772490-1. SB A32-87
Reissue #1
5/4/62
 - h. Fatigue cracks have been found in the support flange and O-ring groove of the MLG retract cylinder gland assembly on aircraft with 5,000 or more hours flight time. SB 32-89
Reissue #1
7/16/63
 - i. Cracks have been found in the MLG forward axle beam pivot arm upper lug. SB 32-91
11/12/62

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- j. MLG forward bogie beam swivel pin lower lugs have been found cracked and failures of bogie beams in "critical area" on the bottom of certain forward bogie beams have occurred. The failures were determined to be a result of corrosion. McDaco letter C1-78-987/WBM Rev. #1 7/17/64 and C1-78-228 2/16/65 and AD 68-26-7
- k. Failures of the nose gear forward door operating mechanism bellcrank have occurred on aircraft having more than 7,000 hours flight time. SB 32-104 9/17/64
- l. Several operators reported nose gear uplatch upper link assemblies broken at the lower attach point. SB 32-112 11/8/65
- m. Malfunctions of the MLG uplatch hook have been due to inadequate lubrication of the pivot bolt bearings. Aircraft fuselage #348 and subsequent were modified prior to delivery. The modification replaced the pivot bolt with one that permits lubrication without removing the bolt. SB 32-113 Rev. #1 8/10/67
- n. Some operators have reported binding of the bearing in the lower support bracket of the MLG I/B door latch due to corrosion. SB 32-114 3/23/66
- o. There have been numerous instances of minute cracks in the machine threaded root of the main gear bogie trim cylinder eyebolt. These cracks were detected on aircraft with approximately 15,000 flight hours. Manufacturer recommends replacing bolt with a bolt incorporating rolled threads. This applies to series 60 aircraft; fuselage #445 and subsequent were modified prior to delivery. SB 32-140 11/6/68
- p. Failures of landing gear bogie beams have occurred due to cracks initiated by corrosion in areas where the bogie beam surface had been damaged. AD 64-5-2

CHAPTER 6. PYLONS/NACELLES

15. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of significant maintenance difficulties that have been reported by air carriers. This information may be useful in identifying structural inspection areas. Except where noted, pylon/nacelle structural references apply to left and right sides of the aircraft.

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| a. <u>Access doors have been found cracked on the R/H side of nacelles in the area of cooling air exit ducts.</u> | SB 54-7
5/18/60 |
| b. <u>Cracks have been found in the tunnel and junction box of each pylon. The cracks occurred due to the welded seam which joins the tunnel to the junction box.</u> | SB 54-17
Rev. #1
9/26/61 |
| c. <u>Cracks have been found in the zee angles located on the left side nacelle door in the area of the upper aft pylon drain fitting support.</u> | SB 54-20
Rev. #1
8/7/61 |
| d. <u>Lower O/B pylon-to-wing attach angles and flexible ribs below pylon spars have been found cracked.</u> | SB 54-24
Reissued 7/25/62
and Revised
8/20/62 |
| e. <u>The vertical leg of the O/B spar cap on the O/B pylon upper spar was found cracked at station Y_{op} 246.000.</u> | SB 54-27
1/26/62 |
| f. <u>Failure of the upper I/B spar cap structure has occurred in the O/B pylons in the area of station Y_{op} 230 at the edges of support fitting P/N 3647306-501.</u> | SB A54-33
Rev. #2 1/24/64
and AD 62-27-4 |
| g. <u>Failure of the upper O/B spar cap structure has occurred in the I/B pylons in the area of stations Y_{ip} 225 to Y_{ip} 233.</u> | SB 54-34
Reissue #1
7/6/64 and
AD 65-5-2 |
| h. <u>Cracks have been found in the I/B and O/B pylon stub wing structure. The cracks have occurred in skins, bulkheads, and spar caps.</u> | Daco Service
Engineering
Letter
C1-78-2016/DBA
10/18/66
SB 54-57
Rev. #1 12/9/69
and AD 67-5-3 |

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- i. Skin and doubler cracks have been found on the O/B side of the O/B pylons between stations Y_{op} 230.000 and Y_{op} 240.000 on aircraft with four percent extended wing leading edge. Aircraft fuselage #448 and subsequent were modified prior to delivery. SB 54-41
Rev. #1
9/27/68
- j. Cracks have been found on O/B pylon stub wings on aircraft with more than 6,000 flight hours. The cracks occurred at station X_w 454.000 and the I/B inter-section adjacent to the leading edge lower slot door. SB 54-42
1/6/67
- k. Operators have reported cracks in the pylon cant bulkhead fitting on aircraft with 17,000 and 18,000 flight hours. SB 54-43
Rev. #1
5/12/67
- l. Cracks have been found in the D-duct spars, adjacent structure, and pylon skin of the I/B pylons. The reported cracks were on aircraft with 14,000 to 21,000 flight hours between station Y_{ip} 204.000 and Y_{ip} 220.000. SB 54-44
Rev. #1
2/10/67
- m. Cracks have been found in the I/B pylon stub wing skin and internal doubler at the cutout for the wing leading edge lower slot door on aircraft with four percent wing leading edge. The cracks were detected in the area aft of station Y_{fs} 22.500 at the wing pylon intersection. SB 54-49
8/25/67
- n. Thrust reverser stow latch pivot bolt failures have occurred. This applies to series 60 aircraft; fuselage #332 and subsequent were modified prior to delivery. SB 54-52
3/28/68
- o. Five failures of forward thrust reverser stow latch on series 60 aircraft at approximately 2,000 flight hours have occurred. SB 54-53
8/20/68
- p. An alert bulletin was issued due to reported cracks in P/N 5753016-1 and -2 wing skin pylon support doubler. The cracks originated at the forward edge of the doubler in the intersection of the I/B side of the I/B pylons and the wing front spar lower cap at W/S X_w 234.000. Aircraft fuselage #451 and subsequent were modified prior to delivery. Although cracks were not reported in O/B pylons, the structure is similar and should also be inspected. SB A54-58
Rev #1
12/16/68

CHAPTER 7. STABILIZERS

16. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of significant maintenance difficulties that have been reported by air carriers. This information may be useful in identifying structural inspection areas. Except where noted, stabilizer structural references apply to left and right sides.
- a. Cracks have been reported in the formers of the vertical stabilizer leading edge at stations Z_{fs} 117.250 to Z_{fs} 179.750 and Z_{fs} 186.000 to Z_{fs} 350.500. SB 55-7
10/18/61
SB 55-11
5/2/63
 - b. Cracks have been detected in the radius of the vertical leg of the horizontal stabilizer closing bulkhead caps, P/N 5654549-1, -2 -501, and -502. The cracks have been up to 4" in length in the aft end of the caps. SB 55-8
Rev. 1
8/13/62
 - c. Operators have reported cracked formers in the horizontal stabilizer leading edges originating at the aft end of the formers. Flying time on aircraft with reported cracks was in excess of 5,000 hours. SB 55-10
5/2/63
 - d. Fatigue cracking has been reported in the vertical stabilizer front spar to fuselage attach fitting at F/S 1500.000 on aircraft with 15,000 to 20,000 flight hours. SB 53-45
Rev. #1
3/12/68

CHAPTER 8. MISCELLANEOUS

17. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of significant maintenance difficulties that have been reported by air carriers. This information may be useful in identifying structural inspection areas.

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| a. <u>Cracks have been found in the vertical flange of the keel beam fittings between the center and rear spar.</u> | SB 51-2
Reissue #1
1/3/61 |
| b. <u>Operators have reported cracks in fuselage frame at refrigerant condenser forward exhaust flap hinges.</u> | SB 51-7
9/3/63 |
| c. <u>Forward and aft passenger entrance door mechanism housings have been found cracked. The cracks were a result of maladjustment of the latching mechanism.</u> | SB 52-14
9/26/60 |
| d. <u>The forward upper cargo door mechanism apex pin assembly has been found cracked on aircraft with approximately 8,000 hours.</u> | SB 52-47
Rev. #1
8/16/68 |

CHAPTER 9. CORROSION PRONE AREAS

18. GENERAL. Corrosion is most likely to strike at the joints or attachment points in metallic structure because they provide entrapment areas for corrosive agents and moisture to accumulate. However, the problem can be compounded if metallic surfaces are exposed to an extremely corrosive environment, or if the surfaces are difficult to inspect and clean. The most important corrosion preventive measure is to keep them clean and dry.
19. EXHAUST TRAIL AREAS. Both jet and reciprocating engine exhaust deposits contain compounds that are very corrosive, and the structure in the path of exhaust gas is more likely to suffer from corrosion than is any other structure. It is customary to coat structure exposed to exhaust gases with protective finishes to prevent these gases from coming in direct contact with the metal. However, the deposits which collect on top of the protective finishes must be removed before they permeate the film and attack the metal. Most troublesome are those areas where exhaust gas deposits may become entrapped and cannot be reached by normal cleaning methods. Typical of these areas are seams, gaps, hinges, or fairings located in the exhaust gas path.
20. ENGINE FRONTAL AREAS AND COOLING AIR VENTS. These areas are subject to erosion by airborne contaminants, rain, and from foreign objects on the runways. Erosion will remove the protective finishes or oxide film from the metal surfaces, leaving them vulnerable to corrosive attack. In addition, much of the equipment installed within these recesses is also vulnerable to corrosion. When an aircraft is operated in a marine environment, salt deposits may accumulate in these areas and the ensuing corrosive attack can be rapid and destructive. It is imperative that these areas be frequently inspected and cleaned, and protective finishes be maintained.
21. BATTERY AREAS AND VENTS. Due to the highly corrosive nature of battery acid and its fumes, battery areas and their vents are protected by special acid-resistant paints. Generally, this is enough to stem the tide of corrosion if scrupulous attention is devoted to keeping these areas clean.
22. LAVATORIES, GALLEYS, AND CABIN FLOORS. The usual spillage, condensation, and other contamination of these areas are extremely corrosive to aircraft metals. The most corrosive agents are acidic foods and beverages, and human excreta. Also, most chlorinated disinfectants are acidic and corrosive, and cannot be recommended for use in aircraft. It is impractical to assume that these areas can be kept clean and dry at all times, but it is important to inspect the structure carefully at suitable intervals, cleaning and renewing the finish as necessary. Areas behind lavatories, sinks, or ranges where waste may collect are potential trouble spots, as are personnel relief and waste disposal vents or openings on the exterior of the aircraft.

23. WHEEL WELLS AND LANDING GEARS.

- a. Equipment installations in the wheel-well areas probably absorb more punishment than any other portion of an aircraft because they are exposed to moisture and flying debris during takeoffs and landings, and when the aircraft is parked, they are exposed to atmospheric moisture. After an airplane has entered service, it is difficult to maintain protective paint film on landing gears, equipment installations, and wheel-well surfaces because the many complicated shapes, assemblies, and fittings in these areas obscure other surfaces. Items that should receive special attention during wheel-well inspections are:
- (1) Magnesium wheels (especially the areas around the bolt heads, lugs, and wheel webs).
 - (2) Portions of rigid tubing obscured by clamps and identification tapes.
 - (3) Exposed electrical equipment.
 - (4) Crevices between ribs, stiffeners, and lower skin surfaces which can serve as water or debris entrapment areas.
- b. Corrosion control in wheel well areas may best be attained by frequent cleaning, lubrication, paint touch-up and judicious use of wheel covers.

24. CONTROL SURFACE RECESSES. Control surface recesses are potential problem areas because normally they are difficult to inspect. If corrosive agents gain entry and accumulate in these areas, they may go unnoticed for some time. Frequent inspection and cleaning of the surfaces and installations located in these recesses will prevent corrosion from gaining a foothold.
25. SPOT-WELDED SKINS. Corrosive agents may become entrapped between the layers of metal adjacent to the spot-weld beads. If moisture enters the area, an electrolytic cell can be set up between the dissimilar metal phases in the spot-weld area, and one or more of these phases will be subject to preferential corrosive attack. Whenever practical, structural areas with spot-welded assemblies should be sealed to prevent the ingress of contaminants and moisture.
26. HINGES. Hinges are natural traps for corrosive agents. Often they are susceptible to galvanic corrosion when the hinges and pins are made of dissimilar metals. The most practical means of corrosion control is to inspect and lubricate hinges frequently. After lubrication, actuation of the door through several cycles is necessary to ensure complete penetration of the lubricant.

27. LAP JOINTS BETWEEN ALUMINUM ALLOY EXTRUDED SECTIONS.

- a. Extruded sections of high-strength materials such as 7075 and 7178 aluminum alloys are more susceptible to intergranular corrosion than are other aluminum alloys. Application and maintenance of chemical processes, sealants, paints, or combinations of these protective measures have proven most effective in controlling corrosive attack on these materials.
- b. If intergranular corrosion occurs, it is usually found around fasteners or in lap joints. It is evidenced by raised areas or lumps under the paint film, and there have been instances where the attack has progressed to such an extent that there were actually bulges in the faying surfaces. These raised areas, lumps, and bulges are due to the accumulation of corrosion products, which take up more volume than did the affected material before it corroded.

28. FLUID ENTRAPMENT AREAS. Design specifications require that aircraft have drains installed in areas where water may collect. However, if drains are rendered ineffective because they are clogged by debris, sealant, etc., or because the level of the aircraft is changed from that of a normal ground attitude, corrosive agents can collect in a localized area. Low-point areas and drains should be inspected frequently to prevent the inception of corrosive attack.

- a. Low points of integral fuel tanks are areas where water condensate can collect. This water and condensate is of doubtful purity, and if permitted to stand, it can permeate the protective coating of the tank and bring many corrosive agents held in suspension in contact with the vulnerable metallic surfaces. Water condensate should be drained regularly from fuel tanks and the integrity of the tank sealant maintained to prevent corrosion of integral tank surfaces.
- b. When considering fluid entrapment areas, one inevitably thinks of aircraft drinking water and wash water systems. Corrosion in these systems is rare because they are fabricated from non-metallic materials and/or stainless steel. Water stagnation should pose no problems so long as sanitation regulations are heeded.

29. ELECTRONIC PACKAGE COMPARTMENTS. Often the safety of those on board an aircraft rests on the proper function of a little black box. The environment of electronic package compartments is carefully controlled to provide the most ideal conditions that can be achieved. The degree to which such sensitive equipment is exposed to corrosive agents is very small, but even small quantities of moisture and contaminants can adversely affect equipment reliability. Components in these areas should be inspected for corrosive attack as thoroughly as possible during routine checks, and advantage should also be taken of nonscheduled component removals for further inspection.

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30. CONTROL CABLES. Control cables have preservative coatings which, when intact, prevent corrosive attack. Due to their vital function, it is necessary to inspect these cables frequently to ensure that they are adequately protected. During these inspections, incipient failures due to other causes also may be detected. It is recommended that control cables be inspected periodically, then cleaned and treated as necessary before reapplication of the preservative.
31. MICROBIOLOGICAL FUEL CONTAMINATION AND CORROSION. Microbiological contamination in turbine fuel is caused by bacteria and fungi which feed on the constituents of the turbine fuel. The result is a sludge, or mat deposit, which has been found in some aircraft fuel tanks and is often loosely referred to as green slime. However, some deposits have been found in various shades of grey, brown, red, and white. If allowed to develop and grow in the aircraft fuel tanks, microbiological contamination can cause a myriad of problems not the least of which is severe aluminum alloy corrosion in the aircraft integral fuel tanks. Since the subject is large and complex, we recommend Douglas Service Magazine, Vol. XXIII, Issue #2, 1965, which contains information on microbiological contamination and other types of corrosion, their causes, and their control. Vol. XXIV, 1966 issue, also contains information on fuel tank microbiological contamination.

CHAPTER 10. MAINTENANCE INFORMATION

32. DC-8 AIRCRAFT MAINTENANCE INFORMATION. The following is a listing of selected significant maintenance difficulties that have been reported by air carriers as mechanical reliability reports from 1970 and 1971 records. This information may be useful in identifying additional structural inspection problem areas. In all cases, check the corresponding trouble area, left right, top bottom, forward aft, etc.

a. Wing.

- (1) During routine inspection a $1\frac{1}{2}$ " crack was found in the upper R/W skin at W/S X_{rs} 367. The total time on the aircraft was 30,358 hours. The operators report referred to this as being a corrosion type crack.
- (2) During overhaul a 6-inch crack was found in the L/W bulkhead upper cap fitting P/N 5615314-1 at W/S X_{rs} 508. The crack was adjacent to the center spar along the bulkhead cap fitting radius. The aircraft total time 38,513 hours.
- (3) Routine inspection disclosed a 2-inch crack in the L/W leading edge lower skin P/N 5754700-3 above #2 pylon and a one-inch crack above #3 pylon. A 4-inch crack was also found in the R/W leading edge skin P/N 5754701-3 above #4 pylon. (Reference manufacturer's All Operator Letter (AOL) 8-490 dated 10/28/70.)
- (4) Routine inspection disclosed a 2-inch crack in L/W front spar upper splice angle at W/S X_{fs} 63, and an 11-inch crack in the R/W front spar forward cap progressing I/B from W/S X_{fs} 67.5. Aircraft total time 37,992 hours.
- (5) During overhaul found a 4-inch crack in L/W stringer #8 forward splice fitting between stations X_{cw} 12.0 and X_{cw} 16.0. The crack was located along the radius formed by the vertical and "Y" legs of the splice. Aircraft total time was 34,888 hours.
- (6) During overhaul a 2 $\frac{3}{4}$ -inch crack was detected in the L/W lower front spar cap at W/S X_{fs} 67.5. The crack originated at an attach hole and progressed through two other attach holes. Aircraft total time 17,982 hours.
- (7) During approach the aircraft had a tendency to roll with wing flaps extended beyond 25° accompanied by a split flap indication. Inspection after landing disclosed a broken compensator link and shaft, P/N 2647101. Aircraft time since overhaul 1,048 hours.

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- (8) During inspection an 8-inch crack was found in the R/W flap support fitting, P/N 5614374-2, at W/S X_{rs} 219. The aircraft total time was 34,261 hours.
- (9) During overhaul a 3-inch crack was found in the L/W support fitting, P/N 5614374-1 at W/S X_{rs} 219. Total aircraft time was 17,700 hours.
- (10) During overhaul a 5-inch crack was found in the radius of attach bracket, P/N 3653812-3 located between the I/B support bearing and the R/H O/B aileron. Total aircraft time 34,345 hours, time since overhaul 10,613 hours.
- (11) Routine inspection disclosed broken mount lugs on the L/H I/B flap actuating cylinder, P/N 5642074-5015. Time since overhaul was 10,915 hours. Operators report attributed breakage to stress corrosion.
- (12) One aircraft was taken out of scheduled service and ferried to a maintenance base due to finding broken L/H O/B flap hinge base fittings P/N's 5653754-1 and 5653755-1 at station 219. Total aircraft time 37,788 hours, time since last service check was 329 hours. Another operator reported a 4-inch crack in the R/H O/B flap hinge base at station 219. Aircraft total time was 37,640 hours.
- (13) Routine inspection revealed partial separation of the L/W flap follow-up cable at W/S X_{rs} 22.750. Cable P/N 5652981-529, total aircraft time 11,346 hours. Operators report attributed separation to be a result of oxidation.
- (14) Routine inspection disclosed a cracked R/H O/B flap hinge base fitting at station 339. Total aircraft time was 37,867 hours.
- (15) During scheduled inspection an 11-inch crack was found in the crank arm of the R/H wing I/B slot torque tube.
- (16) During routine inspection the L/H wing flap drive link, P/N 5655655-501, was found cracked at station 219. Total time since new was 23,145 hours.
- (17) During scheduled inspection the R/H flap support bracket, P/N 5614376-2, was found to have a crack approximately 10 inches in length. Total aircraft time was 35,170 hours.
- (18) A flight returned due to loss of hydraulic fluid. Inspection after landing disclosed a crack in the R/H aileron actuating cylinder, P/N 5613697-5. The crack was along the circumference of the cylinder barrel.

b. Pylon.

- (1) Routine inspection disclosed a 12-inch crack in #4 pylon upper I/B skin at station Y_{op} 230-240. Total aircraft time was 10,419 hours.
- (2) During overhaul, angle P/N 5769515-36 and doubler P/N 5769515-155 were found cracked on the I/B side of #3 pylon. Total aircraft time 10,524 hours.
- (3) During routine inspection a chordwise crack was found in #4 pylon intercostal P/N 5769523-46. The crack was in the horizontal leg and located 1-inch O/B of the pylon upper O/B spar plane. Total aircraft time was 8,091 hours.
- (4) Routine inspection disclosed the lower spar I/B cap broken in two in #1 pylon. The break occurred 12 inches from the aft end at station Y_{op} 248, spar cap P/N 5619820-501. Also found a 3-inch crack in the lower spar web at Y_{op} 248 and two skin cracks at Y_{op} 249. Total aircraft time 32,156 hours. Another operator reported similar discrepancies in #1 pylon at Y_{op} 243 with a total aircraft time of 30,141 hours.
- (5) Inspection found a crack in the vertical leg of the O/B spar cap at station Y_{op} 220 of #1 pylon.
- (6) Routine inspection disclosed a cracked top O/B spar rail at station Y_{op} and a 2-inch crack in the web at station Y_{op} 231 in #4 pylon. Total aircraft time was 34,510 hours.
- (7) A 5-inch crack was found in the O/B skin of #1 pylon at station Y_{op} 235. Total aircraft time was 8,505 hours.

c. Landing Gear.

- (1) During taxi after landing #3 wheel, P/N 152059, failed at the I/B rim, operator reported a total of 2,297 landings. Another operator reported #3 wheel failure during takeoff, total landings since overhaul was 63. Failure was attributed to cracks which originated at corrosion pits.
- (2) A flight was interrupted due to inability to retract the MLG after takeoff. Inspection after landing disclosed the L/H MLG down lock bungee cylinder piston rod broken, P/N 4641900.
- (3) During walkaround inspection found R/H MLG bogie beam broken at the lower swivel lug, P/N 5774700. Operator attributed failure to corrosion due to lack of grease penetration and initiated a program of inspection and modification to reduce possibility of additional failures. A similar condition was also found on the L/H bogie beam of another aircraft.

- (4) A flight returned due to NLG not retracting, inspection found the NLG side brace broken at the retract strut attach lugs, side brace P/N 5771405-5. Total aircraft time 21,838 hours.
- (5) Several operators have reported flight interruptions due to left and right MLG retract cylinder attach pins being broken. These reports showed that the first evidence of malfunction usually an unsafe gear position indication.
- (6) Routine inspection disclosed a cracked L/H MLG bungee cylinder attach casting, P/N 5719176-5511.
- (7) Flight crew reported a severe jolt when the landing gear was extended and did not get a down and locked indication. The aircraft was stopped on the runway and inspection showed the L/H MLG was not locked due to broken retract and bungee cylinders.
- (8) A flight was interrupted due to a loud roar and vibration when gear was retracted after takeoff, fuel was jettisoned and the aircraft returned. Inspection revealed a broken NLG door link, P/N 5646507-501. Total aircraft time was 11,830 hours.
- (9) One operator reported finding a broken O/B brake link rod on the R/H MLG, rod P/N 576390. Total time on rod 10,359 hours.
- (10) During routine brake change, #7 brake carrier lug was found broken off. A total of 225 landings had been made since last brake overhaul.
- (11) After takeoff, the left MLG could not be retracted. Inspection after landing revealed a broken I/B bungee unlock bracket, P/N 6F-8574-501, which prevented the gear from being unlocked from the down position. Total aircraft time was 38,107 hours.
- (12) The #4 wheel broke on landing on one aircraft, wheel P/N 154251-1. There had been 108 landings accumulated since the last overhaul.
- (13) A flight returned due to the landing-gear warning light remaining on after gear was retracted. Inspection found a broken pivot lock arm, P/N 5769871-1, on the left MLG. Total aircraft time was 21,220 hours.
- (14) During scheduled inspection, the R/H MLG forward bogie beam was found cracked at the upper attach lug for the pivot unlock arm. Total aircraft time was 28,269 hours.

d. Fuselage.

- (1) During inspection found severe corrosion on the inner surface of the aft center section lower skin panel P/N 5615372-3, F/S 1150-1290. Also found four cracks 1/2" to 4" in length and light corrosion on longerons and doublers. Total aircraft time was 30,963 hours, time since overhaul 1,801 hours.
- (2) Routine inspection disclosed a 4-inch crack in the upper aft corner of the rear passenger door jamb skin. Total aircraft time 37,221 hours.
- (3) During scheduled inspection cracks were found in the fittings at the top of the pressure bulkhead at F/S 857 in the left and right wheel wells, fitting P/N's 3646874-1 and -2. Total aircraft time 7,771 hours.
- (4) Several operators reporting finding cracks in fuselage former #24, L/H side at F/S 920 and 980, cracks ranged from 2 to 4 inches in length. Total aircraft time ranged from 7,771 hours to 33,091 hours.
- (5) During overhaul, a 2 1/2-inch crack in the O/B flange radius of the L/H MLG support fitting web, support P/N 5750092-501. Repairs were made in accordance with SB 63-61.
- (6) Several occurrences of excessive corrosion have been reported on metal floorboards in the forward gally, center aisle opposite forward galley, and in the mid-lavatory areas. Total aircraft time ranged from 8,027 hours to 11,075 hours.
- (7) Moderate corrosion was found during routine inspection at the following locations on the fuselage skin between stringers 34L and 34R; F/S 640 to 650, F/S 1075 to 1260, F/S 1300 to 1380, and F/S 1430 to 1480. Total aircraft time was 32,735 hours.
- (8) Routine inspection revealed bulged skin and rivets popped at the following locations: F/S 1100, 1200, and 1240 at stringer #36 F/S 1300 at stringer #29, F/S 1420, 1440, 1460, 1480, and 1490 at stringers 27 through 31 right. Total aircraft time was 37,399 hours.
- (9) Scheduled inspection disclosed corrosion of lower fuselage skin adjacent to fasteners and doublers at F/S 420 to 500 and F/S 1180 to 1300 between stringers 33R and 35L. Total aircraft time was 34,510 hours.

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- (10) During routine inspection corrosion was found in the lower aft corner of the forward service door jamb and skin laps. Total aircraft time was 34,510 hours.

e. Miscellaneous.

- (1) An attempt to dump fuel in flight failed. Inspection after landing disclosed a bent L/H dump chute link rod, P/N 3765140.
- (2) The first officer's windshield outer panel shattered during flight on one aircraft. The aircraft was at 28,000 feet with windshield heat in warm position.
- (3) During routine inspection, two 5-inch cracks were found in the rudder fiberglass section at station Z_r 253.0.